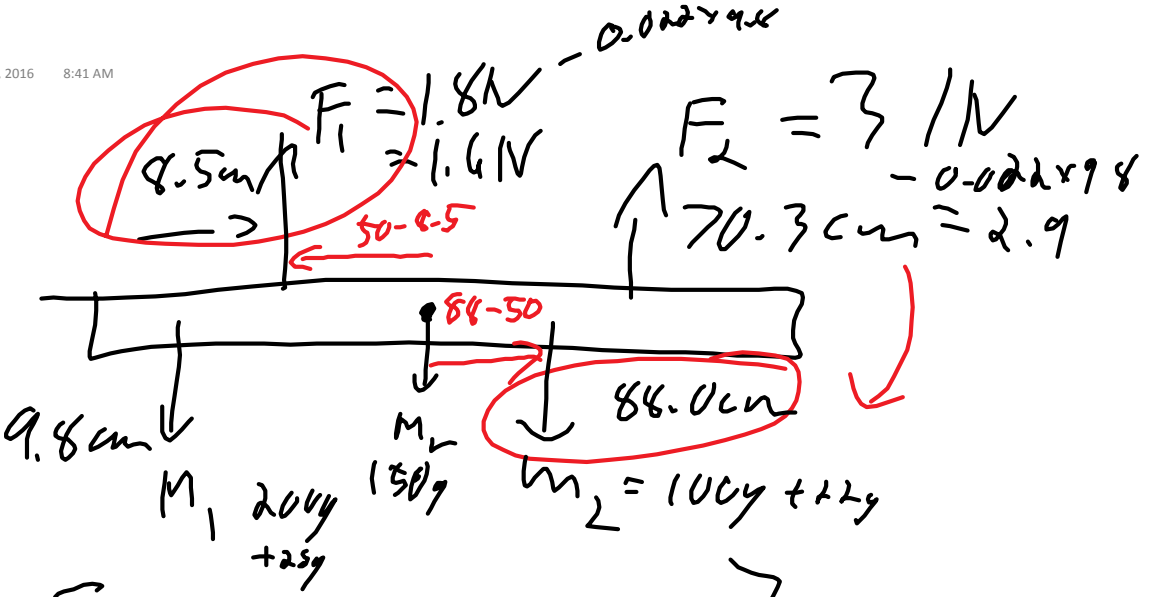
Monday, February 15, 2016 8:41 AM

Lab



$\sum F$

$\sum \tau$ edge reference

$\sum \tau$ centre reference

} % error

$$\sum F = F_{up} - F_{down}$$

clockwise

2.176 + 147 + 1.196

$= -(1.6N + 2.9N) - (0.222kg + 0.151kg + 0.122kg) \times 9.8N/1kg$

$= -1.3N$

$$\%\ error = \frac{1.3N}{\frac{1.6 + 2.9 + }{5}} = 19$$

% error = 70%

$$\sum \tau = \tau_L - \tau_{cc}$$

$\times 0.086$

$$= (2.176N \times 0.098m) + (1.47N \times 0.50m) + (11.96N \times 0.075m)$$
$$0.213\ Nm + 0.735\ Nm + 1.05\ Nm$$
$$- (1.6N \times 0.088m) - (2.9N \times 0.703m)$$
$$0.1408 - 2.04\ Nm$$

$$\boxed{-0.18\ Nm}$$

$$\%\ error = \frac{0.18}{0.84} \times 100 = \boxed{22\%}$$

Set ref. mid point

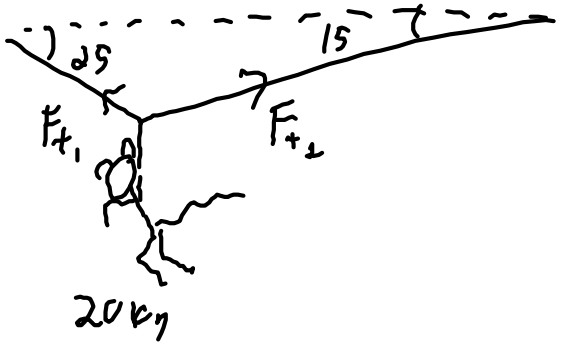
$$T_L - T_{CL}$$

$$1.6N(0.50 - 0.088m) + (11.96N \times (0.88 - 0.5))$$

$$- 1.9N(0.705 - 0.50) - (2.176N \times (0.50 - 0.088))$$

1. a) 20.0kg monkey is hanging from a vine what is

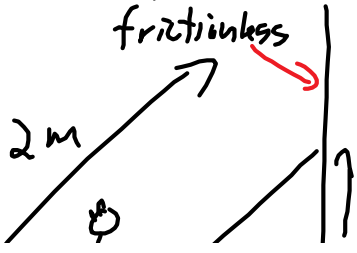
the tension on each side of the vine if



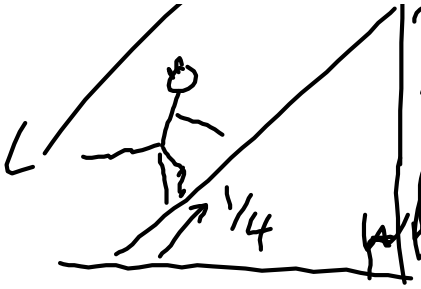
b) A 50kg beam is 20m long and has a cable supporting it 3/4 of way that makes a 40.0 angle.

- what is the tension in the cable?

- If the monkey hangs from the end, what is the tension? and force on the wall?

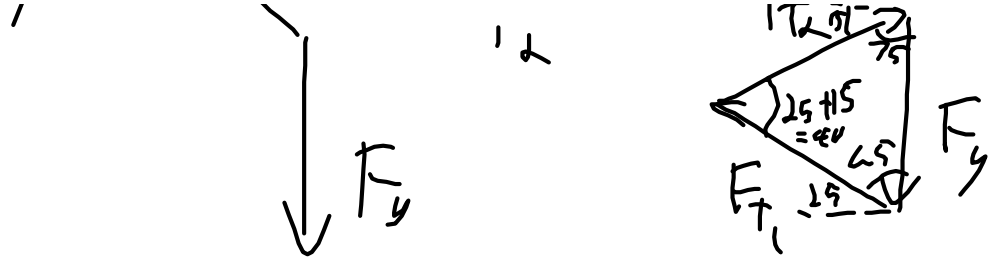
c) 

The 20kg monkey climbs a 5kg ladder resting



climbs up a 75 kg ladder resting on a, frictionless wall. When it is 1/4 of the ladder what is the frictional force of the ground on the ladder?

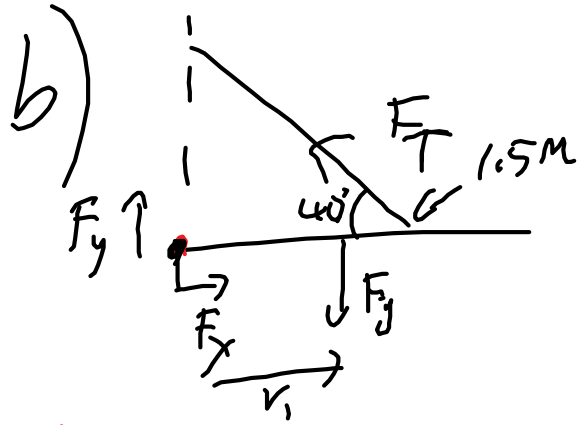
a)



$$\frac{\sin 40}{20\text{kg} \times 9.8\,\text{N/kg}} = \frac{\sin 75}{F_{T_1}} = \frac{\sin 65}{F_{T_2}}$$

$$F_{T_1} = 294\text{N} \quad F_{T_2} = 276\text{N}$$

b)



Set rotation at wall (multiple unknowns F_x, F_y)

$$\Sigma \tau_C = \tau_{CC}$$

$$F_y \times r_1 = F_T r_2 \sin\theta$$

$$(5\text{kg})\left(9.8\,\text{N/kg}\right)(1.0\text{m}) = F_T (1.5\text{m}) \sin 40°$$

$$\boxed{F_T = 51\text{N}}$$

No math key

$$F_1 r_1 = F_T r_2 \sin\theta \quad F_2 r_2$$

$$F_{y_1} r_1 + F_{y_2} r_2 = F_T r_2 \sin\theta$$

$$5\text{kg}\left(9.8\frac{N}{\text{kg}}\right)1.0\text{m} + 20\text{kg}\left(9.8\frac{N}{\text{kg}}\right)(2.0\text{m}) = F_T(1.5\text{m})\sin 90$$

$$\underline{F_T = 457N}$$

force on wall

$$F_x = F_{Tx} = 457N\cos 40^\circ$$
$$= \underline{350N}$$

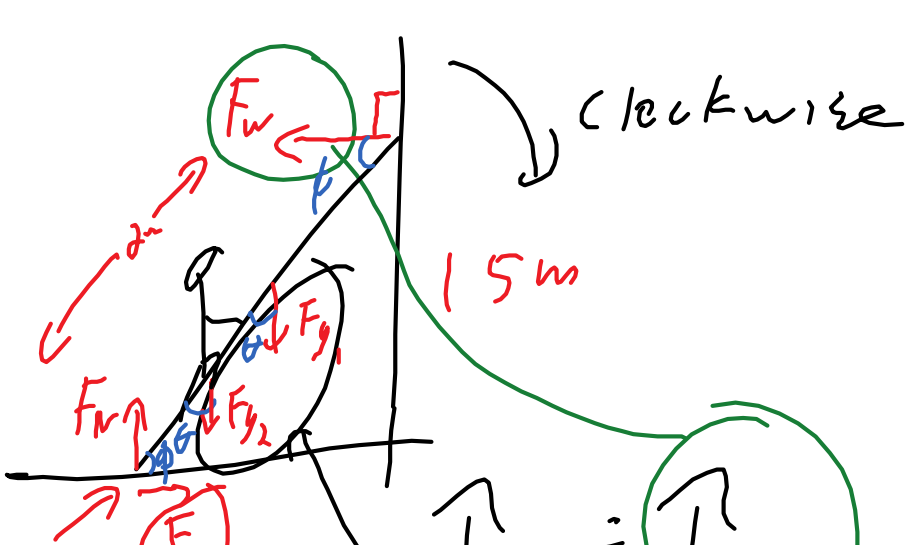
$$F_y = \Sigma F_y - F_T \sin\theta$$

$$= 25\text{kg} \times 9.8\frac{N}{\text{kg}} \quad 457N\sin 40^\circ$$

$$= (-)48.7N$$

Pointing down

c)



$\sin\phi = \frac{1.5}{2}$ $\phi = 48.5°$

$\sin\theta =$ $\theta = 41.4°$

$\tau_C = \tau_{CC}$

$F_{y_2} r_2 \sin\theta + F_{y_1} r_1 \sin\theta = F_w r \sin\phi$

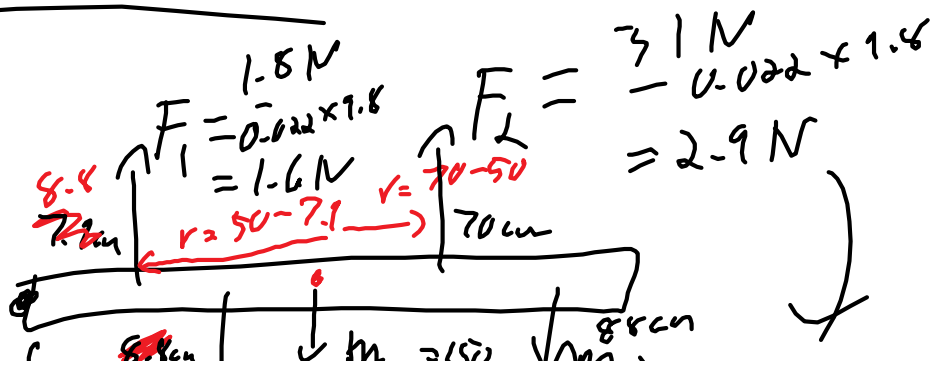
$(5\text{kg})\left(9.8\frac{N}{\text{kg}}\right)\frac{1}{2}\sin 41.4° + 20\text{kg}\left(9.8\frac{N}{\text{kg}}\right)\frac{1}{4} = F_w \sin 48.5$

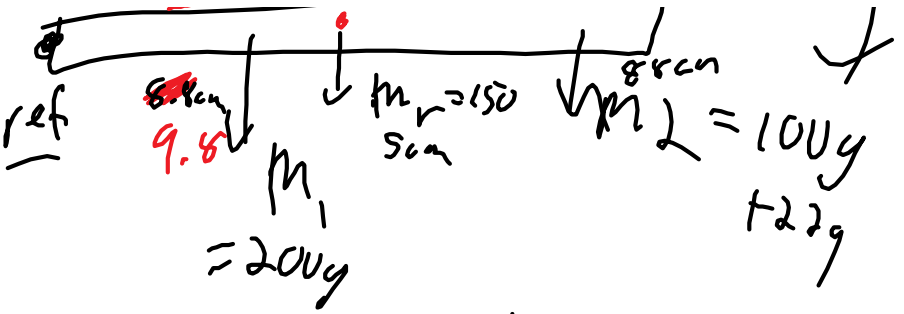
$\sin 41.4°$

$\boxed{F_w = 67.9\,N}$

$\Sigma F_x = 0$ $F_w = \boxed{F_f = 67.9\,N}$ ✓

Block 1-1





$m_1 = 200g$

$+22g = 0.222kg$

$\sum F$ $\quad$ % error $= \frac{\sum F}{\frac{\sum |F|}{\#F}}$

$\sum F = F_{up} - F_{down}$

$= 1.6N + 2.9N - 0.222kg \times 9.8\frac{N}{kg}$

$2.175N$

$- 0.150kg \times 9.8\frac{N}{kg} - 0.122kg\left(9.8\frac{N}{kg}\right)$

$1.47N$ $\quad$ $1.195N$

$= 4.5N - 4.8N = 0.34N = \sum F$

$\sum |F| = 4.5N + 4.8N = 9.3N$

$\frac{1}{5} = 1.86N$

% error $= \frac{0.34}{1.86} = \boxed{18\%}$

Set reference point at end

of meter stick

$\sum \tau_{CC} = \sum \tau_{CC}$

$\tau = F r \sin\theta \quad \theta = 90°$

$F_{g_1} L_1 + F_{g_2} L_2 + F_{g_3} L_3 - F_1 L_4 - F_2 L_5$

$1.47N(0.50m) + 2.175N(0.088m) + 1.1976N(0.86m)$

$0.735Nm + 0.1914Nm + 1.054Nm$

$-1.6N(0.098m) - 2.9N(0.703m)$

$0.1568Nm \qquad 2.0387Nm$

$= -0.221Nm$

$\%\,error = \frac{0.221Nm}{\frac{\sum|\tau|}{5}} = 50$

$= 25\%$

Set ref. at midpoint

$\sum \tau_C = \tau_{CC}$

$F_1 r_1 + m_2 g r_2 - F_2 r_3 - m_1 g r_4$

$1.6N(0.50 - 0.086m) + 2.175N(0.86 - 0.5)$

$1.654Nm \qquad 0.8235Nm$

$-19N(0.703-0.5) - 1\ 954N(0.50-0.098)$

$0.5487\,Nm \qquad 0.4461\,Nm$

$= 0.42\,Nm$

$\%\ error = \frac{0.42}{\Sigma|T|/4} = \boxed{33\%}$